

**FIFTH FIVE-YEAR REVIEW REPORT FOR  
WASTE DISPOSAL ENGINEERING SUPERFUND SITE  
ANOKA COUNTY, MINNESOTA**



**Prepared by**  
**U.S. Environmental Protection Agency**  
**Region 5**  
**CHICAGO, ILLINOIS**

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## LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Closed Landfill Program
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
GWAOC	Groundwater Area of Concern
HBV	Health-Based Value
HRL	Health Risk Limit
ICs	Institutional Controls
MCLs	Maximum Contaminant Levels
MDH	Minnesota Department of Health
Minn. Rule	Minnesota Administrative Rule
MGAOC	Methane Gas Area of Concern
MPCA	Minnesota Pollution Control Agency
MW	Monitoring Well
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCB	Polychlorinated biphenyl
PFAS	Per- and polyfluoralkyl substances
PFCs	Perfluorinated Chemicals
PRP	Potentially Responsible Party
RALs	Risk Action Levels
RAO	Remedial Action Objectives
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
Site	Waste Disposal Engineering Superfund Site
TBC	To be considereds
UU/UE	Unlimited Use and Unrestricted Exposure
VOC	Volatile Organic Compound
WDE	Waste Disposal Engineering

## **I. INTRODUCTION**

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth FYR for the Waste Disposal Engineering (WDE) Superfund Site (Site). The triggering action for this statutory review is the completion date of the previous FYR. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Record of Decision (ROD) did not separate the Site into operable units (OUs), but the Site is tracked by EPA as two OUs, both of which are addressed in this FYR. OU1 addresses the groundwater remedy and OU2 addresses the landfill remedy. The Minnesota Pollution Control Agency (MPCA) is the lead agency managing cleanup of the Site under Minnesota's Closed Landfill Program (CLP). EPA conducts FYRs for the Site in accordance with a multi-site deferral agreement between EPA and MPCA.

The Waste Disposal Engineering Superfund Site FYR was led by Leah Evison, EPA Remedial Project Manager. Participants included Cheryl Allen, EPA Community Involvement Coordinator, and the following participants from MPCA: Shawn Ruotsinoja, Land Manager; Pat Hanson, Construction Manager; Daniel McNamara, Field Representative; Lauren Larkin, Hydrogeologist; and Ben Klismith, Engineer. The review began on November 22, 20017.

### **Site Background**

The Site is located at 14437 Crosstown Boulevard in the City of Andover, Anoka County, Minnesota (App. B, Fig. 1). Land use near the Site consists of a mix of residential, recreational, and commercial uses. The Site accepted a variety of wastes for disposal beginning in 1963 and currently contains about 2.4 million cubic yards of mixed waste. In 1971, the landfill was purchased by WDE and permitted by the State. WDE constructed a 240-ft long by 90-ft wide by 20-ft deep pit in the landfill for disposal of hazardous wastes. Beginning in 1972, approximately 6,600 containers of various hazardous waste materials reportedly were disposed of into the pit. The hazardous waste pit operated until 1974 and the landfill operated until 1983. The current waste footprint covers approximately 76 acres. Waste disposal at the landfill caused groundwater contamination that moved off-site.

## **FIVE-YEAR REVIEW SUMMARY FORM**

<b>SITE IDENTIFICATION</b>		
<b>Site Name:</b> Waste Disposal Engineering		
<b>EPA ID:</b> MND980609119		
<b>Region:</b> 5	<b>State:</b> MN	<b>City/County:</b> Andover/Anoka County
<b>SITE STATUS</b>		
<b>NPL Status:</b> Deleted		
<b>Multiple OUs?</b> Yes	<b>Has the site achieved construction completion?</b> Yes	
<b>REVIEW STATUS</b>		
<b>Lead agency:</b> EPA		
<b>Author name (Federal or State Project Manager):</b> Leah Evison		
<b>Author affiliation:</b> EPA		
<b>Review period:</b> 11/22/2017 – 2/28/2018		
<b>Date of site inspection:</b> 11/13/2017		
<b>Type of review:</b> Statutory		
<b>Review number:</b> 5		
<b>Triggering action date:</b> 4/26/2013		
<b>Due date (five years after triggering action date):</b> 4/26/2018		

## **II. RESPONSE ACTION SUMMARY**

### **Basis for Taking Action**

The basis for taking action at the Site was the presence of multiple contaminants in shallow groundwater and landfill wastes at the Site. Hazardous substances that were found in soil and groundwater include: 1,1-dichloroethane, 1,2-dichloroethene, 1,1,2-trichlorotrifluoroethane, 1,1,1-trichloroethane, methyl ethyl ketone, methyl isobutyl ketone, dichloroethane, toluene, xylene, methylene chloride, acetone, tetrahydrofuran, 1,1-dichloropropene, benzene, dibromochloromethane, 1,1,2-trichloroethane, 1,1,2,2-tetrachloroethane, trichloroethene, 1,3-dichloropropene, ethylbenzene, cumene, and ethyl ether. The primary human health threats included potential ingestion of contaminated groundwater and ingestion of or dermal exposure to contaminants in exposed waste and leachate seeps. In addition, landfill gas (consisting primarily of methane) had the potential to migrate from the Site and was a potential explosive hazard to persons living and/or working in buildings near the Site. Methylene chloride was found to

exceed Clean Water Act standards in Coon Creek and other contaminants in groundwater discharging to the creek had the potential to exceed surface water quality standards.

### **Response Actions**

The MPCA ordered the hazardous waste pit closed effective February 1, 1974. MPCA and EPA made requests to the owner/operator of the landfill to undertake a remedial investigation and propose appropriate remedial measures. No investigations or proposals for appropriate remedial measures were received. In January 1983, the Minnesota Department of Health (MDH) issued a drinking water well advisory in portions of the City of Andover due in part to the hazardous substances disposed of at the Site. EPA listed the Site on the National Priorities List (NPL) on September 8, 1983.

In 1984, EPA and MPCA entered into a Consent Order with nine Potentially Responsible Parties (PRPs) requiring the PRPs to complete a Remedial Investigation/Feasibility Study (RI/FS). Three more PRPs subsequently joined the Consent Order. A RI/FS was conducted at the Site from 1984 through 1987.

EPA signed the ROD for the Site on December 31, 1987. Remedial Action Objectives (RAOs) stated in the ROD include:

- Control potential dust and/or volatilized chemical emissions;
- Control contact with lime sludge;
- Control contact with exposed waste/leachate;
- Minimize contaminant releases to the upper sand aquifer;
- Eliminate or minimize contaminant releases to Coon Creek;
- Reduce the probability of incompatible waste reactions;
- Control the effects of possible reactions that may occur;
- Control future exposure to the contaminated upper sand aquifer;
- Protect the lower sand aquifer by controlling the vertical gradient and the impact of heavier than water non-aqueous phase liquid (NAPL) accumulation; and
- Control of soil gas migration.

The remedy selected to achieve these remedial objectives include the following major components:

- Lime sludge cap meeting Resource Conservation and Recovery Act technical performance standards;
- Groundwater extraction wells in the upper sand aquifer between Coon Creek and the landfill;
- Clay slurry wall around the pit with pumping inside the wall;
- Institutional controls (ICs) to prohibit upper sand aquifer wells at the Site and just north of Coon Creek and to prohibit lower sand aquifer wells near the landfill;
- Carbon adsorption treatment of extracted groundwater (air stripping or a combination is possible based on design);
- Discharge of treated extracted groundwater to Coon Creek; and

- Monitoring, including geophysical work around the Site to locate heavier-than-water non-aqueous phase liquid monitoring, to assure the effectiveness of the remedy.

The ROD does not include groundwater cleanup standards but indicates that Federal Maximum Contaminant Levels (MCLs) and State Risk Action Levels (RALs) established by MDH are ARARs for the groundwater containment action at the Site. Since the time of the ROD, MDH discontinued use of RALs and has established Health Risk Limits (HRLs) and Health-Based Values (HBVs) for evaluating the safety of private drinking water supplies. HRLs are promulgated values; HBVs are values that MDH intends to promulgate in the near future. In this FYR, groundwater results are compared to MCLs, HRLs, and HBVs.

The response actions for the Site required by the ROD are complete with the exception of ongoing groundwater extraction and treatment and monitoring and maintenance of the landfill and of ICs.

### **Status of Implementation**

#### **Groundwater**

The landfill does not have a liner or a leachate collection system because it was constructed initially as a dump. Leachate moves from the waste into the groundwater and is captured by a groundwater containment and treatment system. The original groundwater containment and treatment system was constructed between 1992 and 1995 and consisted of ten groundwater extraction wells and an air on-Site stripper for treatment.

#### **Landfill Cap and Gas Extraction**

The landfill cap and a system of passive gas vents were constructed beginning in 1992. In 1998, the passive gas collection system was replaced by a system of 53 active gas collection wells and an enclosed flare. The gas extraction system minimizes migration of landfill gas away from the landfill. Gas migration is monitored through a system of 19 gas probes. The landfill cap consists of a 24-inch clay layer overlain by sand, clean fill, and vegetated topsoil. Total cap thickness is approximately six feet. The landfill cap reduces contaminant loading to the groundwater beneath the landfill by reducing the amount of precipitation that infiltrates in the waste fill material.

#### **Hazardous Waste Pit and Slurry Wall**

A bentonite slurry wall was constructed around the pit in 1994, with its base in contact with a clay layer that underlies the pit. A leachate extraction well was constructed within the slurry wall that surrounds the hazardous waste pit and screened on top of a gray silt unit that is 15 feet below of the pit. (Two additional leachate extraction wells were also constructed inside the slurry wall, but it was found that they did not allow pumping at a high enough rate to be useful.) A gas extraction well was also constructed and operated within the pit. The extraction wells were installed in the pit to remove leachate and to allow an inward hydraulic gradient to be maintained across the slurry wall. An additional treatment system was installed in the pit in 2009 and operated during the period of this FYR. The inward gradient is intermittently achieved. Contamination from the pit and contamination that escapes the pit is contained and treated in the groundwater treatment system. MPCA is proposing to excavate and dispose of hazardous wastes from within the pit and, in 2016, secured State funds to remove wastes from within the pit.



### Post-ROD Upgrades

MPCA has instituted the following upgrades at the Site, described further in the Systems Operations/Operation & Maintenance section of this FYR report:

- In 1998, MPCA upgraded the passive gas collection system by converting it to an active system.
- In 2002, MPCA discontinued use of the air stripper for groundwater treatment and installed an on-Site lined aeration basin and an on-Site infiltration pond.
- In 2007, MPCA installed a Landfill Gas-To-Energy system to convert landfill gas to usable energy rather than combusting it in the enclosed flare. This system operated for three years but was shut down in 2010 due to contaminant characteristics in the landfill gas that made the Gas-to-Energy system difficult to maintain. At that time, use of the enclosed flare was re-started.
- In 2009, MPCA installed a pilot system known as a Cryogenic, Condensate, and Compression system to remove vapor-phase contamination from the hazardous waste pit. The pilot system operated until 2010, and it was replaced by a full-scale system that began operation in 2013.
- In 2012, MPCA added granular activated carbon treatment for polychlorinated biphenyls (PCBs) to groundwater extracted from the hazardous waste pit. (PCB treatment is not needed for groundwater extracted from other locations at the landfill.)
- In 2016, MPCA secured State funds to remove wastes from within the hazardous waste pit from the landfill for off-Site disposal. Pre-design studies are underway at the time of this FYR and removal is expected to be conducted in 2019.

EPA and MPCA discussed MPCA's plans to remove wastes from the hazardous waste pit. Under its deferral agreement with MPCA, EPA retains authority over the Site to the extent that the proposed response actions are not "at least as protective of human health and environment as response actions required under CERCLA." MPCA has provided EPA with documents relevant to its proposed action to remove and properly dispose of wastes from within the pit. In a letter dated October 18, 2017, MPCA agreed to document its decision consistent with existing Minnesota law and procedures.

### Sitewide

EPA signed a Preliminary Closeout Report on September 27, 1995 to document that remedy construction was completed at the Site.

EPA removed the Site from the NPL on June 5, 1996, as specified by the deferral agreement between EPA and MPCA. Since contaminants remain at the Site above levels that allow UU/UE, EPA continues to conduct FYRs to ensure that the Site remedy remains protective of human health and the environment.

## **Institutional Controls**

The tables on the following pages summarize the ICs which are currently in place for the Site. Maps depicting the areas covered by the ICs are referenced in the tables.

**Table 1A: Institutional Controls Summary Table**  
**Waste Disposal Engineering Landfill; Andover, Minnesota**

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Document*	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date
<u>Landfill waste area.</u> Engineered controls for the landfill waste area consist of a constructed hazardous waste landfill cover.	Yes	Yes	Generally depicted on App. B, Fig. 1.	ICs to prohibit interfering with the landfill cover integrity and on-Site remedy components, including components of the extraction and treatment systems for the hazardous waste pit, contaminated groundwater, and landfill gas.	Implemented: - Minn.Stat. §115B.39 through §115B.46 - Ordinance 19P - Minn. Stat. §115B.412, Subd.9 - WDE Land Use Plan, March 30, 2006. - Amended zoning map (CLR Zoning) **
<u>Hazardous waste pit within the landfill area.</u> Engineered controls for the hazardous waste pit within the landfill consist of a clay slurry wall around the pit, operation of interior gradient extraction wells, and treatment of extracted groundwater.	Yes	Yes	Generally depicted on App. B, Fig. 1.	ICs to prohibit interfering with the landfill cover integrity and on-Site remedy components, including components of the extraction and treatment systems for the hazardous waste pit, contaminated groundwater, and landfill gas.	Implemented: - Minn.Stat. §115B.39 through §115B.46 - Ordinance 19P - Minn. Stat. §115B.412, Subd.9 - WDE Land Use Plan, March 30, 2006. - Amended zoning map (CLR zoning) **
<u>Contaminated groundwater throughout the landfill area.</u> Engineered controls consist of an on-site upper aquifer groundwater extraction and treatment system between the northeast corner of the landfill waste and Coon Creek (off-site).	Yes	Yes	Generally depicted by hatched area on App. B, Fig. 2.	ICs to prohibit interfering with the landfill cover integrity and on-Site remedy components, including components of the extraction and treatment systems for the hazardous waste pit, contaminated groundwater, and landfill gas	Implemented: - Minn.Stat. §115B.39 through §115B.46 - Ordinance 19P - Minn. Stat. §115B.412, Subd.9 - WDE Land Use Plan, March 30, 2006. - Amended zoning map (CLR zoning) **

<p><u>Landfill gas throughout the landfill area.</u> Engineered controls consist of an on-site passive landfill gas collection and treatment system. Active landfill gas controls were added after construction was completed. Monitoring demonstrates that ARARs are achieved at the site boundary.</p>	Yes	Yes	Generally depicted on App. B, Fig. 3.	ICs to prohibit interfering with the landfill cover integrity and on-Site remedy components, including components of the extraction and treatment systems for the hazardous waste pit, contaminated groundwater, and landfill gas.	<p>Implemented:</p> <ul style="list-style-type: none"> <li>- Minn.Stat. §115B.39 through §115B.46</li> <li>- Ordinance 19P</li> <li>- Minn. Stat. §115B.412, Subd.9</li> <li>- WDE Land Use Plan, March 30, 2006.</li> <li>- Amended zoning map (CLR zoning) **</li> </ul>
<p><u>Landfill gases at the boundary of the landfill and on adjacent property.</u> Based on post-construction monitoring data, landfill gas levels achieve ARARs at and beyond the landfill boundary; therefore, no ROD-specified landfill gas remedy components are applicable to adjacent properties.</p>	No	No	Generally depicted on App. B, Fig. 3.	No ROD-specified IC objective/mechanism on adjacent properties since the areas adjacent to the landfill were not expected to be adversely affected by landfill gas.	<p>Implemented:</p> <ul style="list-style-type: none"> <li>- Roth Entities Memorandum of Institutional Controls</li> <li>- 1999 Deed Conditions and Restrictions</li> <li>- Ordinance 19P</li> <li>- Minn. Stat. §115B.412, Subd.9</li> <li>- 2006 WDE Land Use Plan.</li> </ul>
<p><u>Upper aquifer: contamination extends from the northeast edge of the Site to Coon Creek (previously it crossed Coon Creek on the Hupp property).</u> The landfill remedy will reduce the source of upper aquifer contamination.</p>	Yes	Yes	Generally depicted by hatched area on App. B, Fig. 2.	IC prohibits using the upper aquifer and constructing extraction wells in this aquifer, on the northeast adjacent property to and beyond Coon Creek.	<p>Implemented:</p> <ul style="list-style-type: none"> <li>- Declaration of Restrictive Covenants</li> </ul>

<p><u>Lower aquifer: No significant contamination found extending both northeast from the Site onto the Hupp Property and south from the Site onto the Roth Entities Properties.</u></p> <p>The lower aquifer adjacent to the landfill is protected from contamination by prohibiting lower aquifer extraction on the landfill and on adjacent near-by properties. This preserves the lower aquifer's artesian qualities, isolating it from landfill contaminants.</p>	Yes	No		<p>ROD recommends "considering" ICs to prohibit lower aquifer extraction wells in areas that may impact the flow of contaminants in the upper aquifer.</p>	<p>Implemented:</p> <ul style="list-style-type: none"> <li>-Roth Entities Memorandum of Institutional Controls.</li> <li>- Ordinance 19P</li> <li>- Minn. Stat. §115B.412, Subd.9.</li> <li>- 2006 WDE Land Use Plan.</li> </ul>
<p><u>All groundwater: Area within 600 feet of landfill</u></p>	Yes	No		<p>Prohibits construction of new water-supply well within 300 feet of a mixed municipal solid waste landfill, or 600 feet for a sensitive water-supply well**</p>	<p>Minnesota Administrative Rule 4725.4450***</p>

\* See Sections VI and VII of ROD.

\*\*Minnesota Rules define "sensitive water-supply well" as a water-supply well with less than 50 feet of watertight casing where the casing does not penetrate a confining layer or penetrate multiple layers of confining materials with an aggregate thickness of 10 feet or more.

\*\*\* A current zoning map for the City of Andover can be found at the following Internet web site:

[ HYPERLINK "<https://www.andovermn.gov/documentcenter/view/228>" ]

<b><u>Table 1B: Institutional Controls Summarized By Areal Extent</u></b> <b>Waste Disposal Engineering Landfill; Andover, Minnesota</b>			
<b>Institutional Control Name</b>	<b>Date(s) Implemented</b>	<b>Type of Control</b>	<b>Total Acres</b>
Roth Entities Memorandum of Institutional Controls.	November 16, 1993	<u>Proprietary Control:</u> Recorded by property owner, Roth Entities on property.	110 acres, south of the site (App. D, Fig. 9).
Tax Forfeiture.	Approximately 1995	<u>Governmental Control:</u> Through tax forfeiture, the landfill is owned by, and 110 acres south of the landfill were owned by Minnesota.	224 acres, consisting of 114 acres for the landfill and 110 acres south of the landfill (App. D, Fig. 6 and 9).
Landfill Cleanup Agreement Document # 1203355.	October 1995	<u>Governmental Control:</u> Anoka County administers the landfill while MPCA controls the Site pursuant to the Landfill Cleanup Act, Minn. Stat. '115B.39-115B.46 (1996). The Landfill Cleanup Act authorized the MPCA to enter into the Landfill Cleanup Agreement with U.S. EPA whereby MPCA assumed all future responsibility for the landfill, except for CERCLA mandated provisions.	100 acres (App. D, Fig. 6).
City of Andover Municipal Code, Ordinances 19P, 19N.	January 16, 1996	<u>Governmental Control.</u>	250 acres on and surrounding the landfill (App. D, Fig. 8).
MPCA's WDE Land Use Plan.	March 30, 1996	<u>Governmental Control:</u> Developed under authority granted through Minn. Stat. §115B.412, Subd.9. The statute requires local zoning to conform to the plan. MPCA's WDE Land Use Plan designates the landfill as "Closed Landfill Restricted" providing for "open space with no public use or development," while allowing development of adjacent lands.	114 acres (App. D, Fig. 6, 8, and 9).
Deed Conditions and Restrictions.	January 20, 1999	<u>Proprietary Control:</u> Filed by the State prior to transferring ownership for development, of 107 acres south of the landfill.	107 acres. The State retained 3.3 acres (App. D, Fig. 9).
Declaration of Restrictive Covenants; entered into by property owner(s) William G. Hupp and Kathleen M. Hupp with Nature Properties, LLC.	November 27, 2001	<u>Proprietary Control:</u> Restricting ground and surface water use.	13.8 acres, northeast of and adjacent to the northern border of the landfill (App. D, Fig 6).

Amended zoning map.	Current Version: March 2007	<u>Governmental Control.</u>	114 acres (App. D, Fig. 10).
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### Status of Access Restrictions and ICs:

ICs for soil and groundwater are currently in place for the Site as listed in Table 1A and 1B. There have been no changes to the ICs during the period of this FYR; however, in 2013, ownership of the Site property changed from Anoka County to the State of Minnesota with administration by MPCA.

### Current Compliance:

MPCA reports that based on site inspections there have been no instances of non-compliance during the period of this FYR.

### IC Follow up Actions Needed:

Long-term protectiveness requires continued compliance with the land and groundwater use restrictions to ensure that the remedy continues to function as intended. Implementation of the long-term stewardship (LTS) plan, developed in February 2018, will ensure that the ICs are maintained, monitored and enforced, as discussed below.

### Long Term Stewardship:

Since compliance with ICs is necessary to ensure the protectiveness of the remedy, planning for LTS is required to ensure that the ICs are maintained, monitored and enforced so that the remedy continues to function as intended. In February 2018, MPCA developed a LTS plan for the Site that ensures periodic review of ICs and specifies actions to be taken.

### Informational Devices

Although not ICs, other informational devices have been implemented and updated at the Site during the period of this FYR. MPCA has developed a Groundwater Area of Concern (GWAOC) map (App. B, Fig. 2) and a Methane Gas Area of Concern (MGAOC) map (App. B, Fig. 3) to inform potential well drillers and the public of potential concerns, and to assist local government with land use planning in areas surrounding the Site. MPCA posts links to the maps on its web site to inform local residents and well drillers, and shares the maps with the MDH's Well Management Unit which is responsible for permitting well construction. MPCA sends updated GWAOC and MGAOC maps to local units of government when the maps are updated.

EPA designated the Site as Site-Wide Ready for Anticipated Use (SWRAU) on February 11, 2008.

## **Systems Operations/Operation & Maintenance**

### Landfill and Gas Systems

MPCA's field representative and an MPCA contractor inspect the landfill cap as needed for erosion or other damage and repairs are made when and where necessary to maintain integrity. Maintenance is provided by a MPCA contractor and includes maintaining proper slopes for positive drainage of the fill area, periodic mowing to control woody vegetation, inspection for invasive species, and other cap maintenance procedures. The landfill cap is mowed generally twice per year. During the period of this FYR, the landfill cap has not needed removal of invasive species or major maintenance procedures.



An MPCA contractor inspects landfill gas extraction wells regularly and monitors condensate liquid levels to determine if any well is made inoperable due to perched leachate. The contractor samples gas probes located nearest residences monthly and the remainder of the 27 gas probes quarterly to monitor that no off-site gas migration is occurring. The gas probes are located around the landfill perimeter and are concentrated more densely in areas where residential neighborhoods are closest to the landfill.

Gas monitoring results are discussed in the Data Review section of this FYR report and a data table and probe location map are found in Appendix B of this FYR report.

#### Groundwater Extraction, Treatment and Monitoring Systems

An MPCA contractor inspects the eight groundwater extraction wells and treatment system regularly and arranges for performance maintenance as needed. Operation and maintenance (O&M) is performed regularly by an MPCA contractor for the groundwater treatment system. During the period of this FYR, extraction wells needed acid redevelopment approximately twice per year to maintain their flow rate, carbon exchange for the PCB removal system was needed generally twice each year, and the re-start of the aeration pond sprayer was needed periodically. In 2017, extraction well EW-7 was shut down for approximately one month for parts replacement.

An MPCA contractor samples the system of 71 monitoring wells quarterly. Samples are analyzed for a wide variety of contaminants, including VOCs, semi-volatile organic compounds (SVOCs) and metals. During the period of this FYR, there were no significant maintenance issues with monitoring wells. Groundwater monitoring results are discussed in the Data Review section of this FYR report and a map showing the locations of groundwater extraction and monitoring wells is found in Appendix B of this FYR report.

### **III. PROGRESS SINCE THE LAST REVIEW**

This section includes the protectiveness determinations and statements from the last FYR as well as the recommendations from the last FYR and the current status of those recommendations.

**Table 2: Protectiveness Determinations/Statements from the 2013 FYR**

<b>OU #</b>	<b>Protectiveness Determination</b>	<b>Protectiveness Statement</b>
1	Protective	The remedy at OU1 is protective of human health and the environment. The groundwater exposure pathways that could result in unacceptable risks are being controlled by the slurry wall and vapor extraction system associated with the hazardous waste pit, and the wider-area contaminated groundwater capture and treatment system. Institutional controls for groundwater are in place and effective.
2	Protective	The remedy at OU2 is protective of human health and the environment. The exposure pathways that could result in unacceptable risks are being controlled by the landfill cap and landfill gas control system. The remedial action objectives of controlling contact with exposed waste and potential volatile emissions, and of minimizing contaminant releases from landfill wastes to the upper sand aquifer, are being met. Institutional controls for the landfill are in place and effective.

Sitewide	Protective	The remedy at the WDE Site currently protects human health and the environment because the remedy has been constructed in accordance with the requirements of the ROD, enhancements to the remedy have been implemented including an active landfill gas control, and the remedy is functioning as intended; source control measures, including the vapor extraction system implemented in the hazardous waste pit since the last five year review, are reducing volatile source material and, along with the landfill cap, reducing leachate production. Groundwater is being contained and treated. Groundwater monitoring has demonstrated a slow downward trend in concentration of certain contaminants and stable concentrations of others. Exposure pathways that could result in unacceptable risk are being controlled. Existing Site uses are consistent with the objectives of the land- and groundwater-use restrictions and ICs remain in place and are effective.
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No issues and recommendations for follow-up action were identified at the Site during the 2013 FYR that affect protectiveness of the remedy. One issue that did not affect protectiveness but was identified was the need to update the decision document to reflect the change from a passive to an active gas collection system and to reflect other technical changes to the groundwater treatment and discharge system. This has not yet been completed.

#### **IV. FIVE-YEAR REVIEW PROCESS**

##### **Community Notification, Involvement & Site Interviews**

A public notice entitled *EPA Begins Review of Waste Disposal Engineering Superfund Site* was published in the Anoka County Shopper on November 22, 2017, stating that there was a FYR and inviting the public to submit comments to EPA. No comments were received in response to EPA's notice. One member of the public called EPA with questions in response to an MPCA notice of a public meeting to present MPCA's plans for removal of the hazardous waste pit. The caller relayed concerns about the effects of the landfill on groundwater and had questions about who was paying for removal of the hazardous waste pit. EPA answered questions based on our ongoing FYR and referred the caller to MPCA for additional information. The results of EPA's FYR and the report will be made available at the offices of MPCA located at 520 Lafayette Road North, St. Paul, Minnesota and on EPA's website. No interviews were conducted for this FYR.

The Site has been deferred to MPCA's CLP, which involves the public as appropriate and maintains a web site at [ HYPERLINK "<https://www.pca.state.mn.us/featured/cleaning-hazardous-waste-wde-landfill>" ]. MPCA held a public informational meeting for the Site on November 29, 2017 to discuss the State's plans for removal of the hazardous waste pit.

## **Data Review**

### **Landfill Gas**

Methane gas is an odorless gas produced when landfill wastes decompose. Methane can be explosive in confined spaces such as basements when mixed in air. Before a fire or explosion can occur, three conditions must be met simultaneously. A fuel (methane) and oxygen (air) must exist in certain proportions, along with an ignition source, such as a spark or flame. The lower explosive limit, or level of gas which must be present for an explosion to occur if other conditions are met, for methane is 5%.

Methane gas at this Site is monitored through a series of 19 gas probes that surround the landfill. The locations of gas probes are shown in Appendix B, Figure 3. During the period covered by this FYR (2013 to 2018), no methane was detected in any probe at the Site, and high concentrations of methane were detected at the flare, where the methane is safely combusted. This demonstrates that operation of the active gas control system is successfully controlling potential exposure to landfill gas at the Site.

### **Hazardous Waste Pit**

During the early 1970s, a 240-ft long by 90-ft wide by 20-ft deep hazardous waste pit was constructed on top of the landfill. From 1972 to 1974 approximately 6,600 containers (including drums) of various hazardous waste materials reportedly were disposed of into the pit. As part of the Site remedy, a bentonite slurry wall was constructed around the pit with its base in contact with a clay layer that underlies the pit. A leachate extraction well (EW-9) was constructed within the slurry wall that surrounds the hazardous waste pit and screened on top of a gray silt unit that is 15 feet below the pit. (Two additional leachate extraction wells, EW-14 and EW-15, were also constructed inside the slurry wall, but it was found that they did not allow pumping at a high enough rate, so these two were not operated.) A gas extraction well was also constructed and operated within the pit. To the extent technically feasible, the extraction wells are operated with the goal of creating and maintaining an inward gradient across the slurry wall. This is only partly feasible due to the configuration of the underlying clay layer and the high rate of bio-fouling caused by the characteristics of the wastes at this location.

In 2013, MPCA constructed and began operation a full-scale system for removal of liquid and gas contaminants from the hazardous waste pit. The system has operated nearly continuously during the period of this FYR and has continued to remove highly contaminated vapor condensate. However, high levels of contaminated leachate have continued to leak from the pit. Leachate that escapes the pit is captured, predominantly by pumping well EW-9.

In 2017, MPCA, with the assistance of a contractor, performed an investigation of the hazardous waste pit, resulting in a report entitled *Pre-design Investigation Report, Industrial Waste Pit Removal Action*, dated June 1, 2017. The report included results of a field investigation and a conceptual design for removal of the pit. In November 2017, MPCA presented an overview of the conceptual removal plan to the public.

### **Groundwater**

#### *Plume Capture*

The contaminant plume in groundwater at this Site exists beneath the landfill in the upper sand aquifer and extends north of the landfill in the direction of groundwater flow (App. B., Fig. 2, hatched area). The groundwater contamination plume is prevented from flowing beyond Coon Creek by a combination of pumping from seven groundwater extraction wells located along the south boundary of the creek, and potentially also by discharge to the creek of groundwater not captured by the pumping wells.

In 2016, MPCA, with the assistance of a contractor, conducted studies to evaluate groundwater flow directions and groundwater quality in the shallow sand aquifer (the aquifer affected by the Site) north of Coon Creek. As part of this investigation, four new groundwater monitoring wells were installed at two nested locations north of the creek (MW-26A/B and MW-39A/B, shown in App. B, Fig. 4). Results of the study are documented in a letter report dated June 28, 2016 entitled *Groundwater Assessment North of Coon Creek, Waste Disposal Engineering Inc. Closed Landfill, Andover, Minnesota*. Water levels measured in the new wells and in existing monitoring wells document that groundwater flow is toward the creek from both sides of the creek (App. B, Fig. 5). Flow paths at the time of the 2016 study also suggest that the extraction wells may not by themselves be fully capturing the plume, and that the plume is captured by a combination of extraction well pumping and discharge of some shallow groundwater to the creek. Although the ROD anticipated the possibility of some discharge to the creek—see, for example the RAO to eliminate or minimize discharge to the creek—Section VII of the ROD, Recommended Alternative, indicates that the extraction system will intercept all contaminated groundwater migrating from the Site and currently entering Coon Creek. This FYR includes a recommendation to further evaluate the extent of plume capture due to extraction well pumping and take actions to minimize discharge to the creek if indicated.

The new wells were sampled for VOCs and metals to look for possible evidence of landfill-related contaminants north of the creek. No VOCs were detected in three of the wells and estimated concentrations (below method reporting limits) of two VOCs were detected in one of the new wells, at levels several orders of magnitude below drinking water standards. Several naturally occurring metals, including arsenic and manganese, were present in all four new wells. Of the metals, only manganese was present at concentrations above its drinking water standard. This is a common occurrence in many aquifers in Minnesota due to the natural occurrence of manganese in glacial drift and bedrock in the state. The sampling data overall confirm that the landfill is not affecting groundwater north of Coon Creek.

#### *Comparison to Drinking Water Criteria*

For this FYR, groundwater-monitoring results at the Site were compared to current drinking water standards that are the equivalent of the standards established in the ROD. The drinking water standards currently used are federal MCLs, State of Minnesota HRLs and State of Minnesota HBVs. Concentrations of a variety of organic contaminants exceed drinking water standards in groundwater beneath the landfill, as well as arsenic and manganese that are non-organic contaminants and may be in part naturally occurring.

The locations of groundwater monitoring wells are shown in Appendix B, Figure 4. Groundwater monitoring results from wells that exceeded a drinking water standard in 2017 for organic contaminants are shown in Appendix B, Table 4. This table shows the current drinking water standard for each organic contaminant, as well as the ratio of the contaminant concentration to the lowest current drinking water standard (called the “risk ratio” in the table.)

The most highly contaminated groundwater at the Site is captured by extraction well EW-9, located beneath the hazardous waste pit. At this location, trichloroethylene, cis-1,2 dichloroethylene, vinyl chloride and tetrachloroethylene are all present at over 1,000 times their respective drinking water standard. PCBs in the form of Arochlor 1242 and several other contaminants were also captured by this extraction well at lower risk ratios.

### *Emerging Contaminants*

The emerging contaminant 1,4-dioxane was analyzed for in most extraction and monitoring wells in Spring 2017 and exceeded the HRL at 13 locations, as shown in Table 4. The new wells added north of the creek in 2016 (MW-21 and MW-39 well nests) were not sampled for 1,4-dioxane. (Other organic contaminants were not detected at these locations.)

Another group of emerging contaminants known as per- and polyfluoralkyl substances (PFAS) or perfluorinated chemicals (PFCs) was not sampled at the Site during the period of this FYR; however, effluent from the treatment pond was analyzed for these substances in 2006 and 2012. In 2006, no PFAS was detected at detection limits ranging from 0.5 to 1 µg/L. By 2012, analytical methods had improved and six PFAS compounds were detected, as shown in Table 3 below.

**Table 3. PFAS Compounds Detected in Treatment Pond Effluent (2012)**

PFAS Compound	Concentration (µg/L)	Regulatory or Risk-Based Level
Perfluorooctane sulfonate (PFOS)	0.009	0.027 (MDH HBV) 0.070 (EPA Health Advisory*)
Perfluorobutanoic acid (PFBA)	0.48	7 (MDH HRL)
Perfluorooctanoic acid (PFOA)	0.17	0.035 (MDH Risk Assessment Advice) 0.070 (EPA Health Advisory)
Perfluorohexanoic acid (PFHxA)	0.074	ND (MDH RAA)
Perfluoropentanoic acid	0.093	
Perfluorohexane sulfonate (PFHxS)	0.014	ND (MDH RAA)

\*EPA's health advisory applies to PFOS and PFOA individually and combined.

Of the PFAS compounds detected in the effluent, PFOA exceeded the EPA Health Advisory and PFOA, Perfluorohexanoic acid and PFHxS exceeded the MDH Risk Assessment Advice Level. A recommendation to conduct additional sampling for 1,4-dioxane and PFAS/PFCs to confirm the extent of the plume for these contaminants has been added to the recommendations section of this FYR.

### *Groundwater Trends*

Groundwater trends were not evaluated for this FYR because the remedy is not a restoration remedy; however, in general, as the waste further degrades, contaminant concentrations in groundwater are expected to decline.

### *Comparison to Surface Water Criteria*

As discussed above, shallow groundwater that is not captured by the extraction wells at the Site discharges into Coon Creek, which flows near residential areas and eventually to the Mississippi River. For this FYR, monitoring well data from six wells closest to the creek (A1/B1, A2/B2, A3/B3) were compared to Class 2B surface water quality chronic criteria (for aquatic life and recreational use) under Minnesota Rules Chapter 7050. No exceedances were found, indicating that the landfill is unlikely to be adversely impacting surface water quality of Coon Creek. A recommendation has been added to this

FYR that MPCA add routine comparison of groundwater data to surface water quality criteria so that any future exceedances can be identified and addressed as quickly as possible.

#### *Treatment Discharge Compliance*

After pre-treatment, the extracted groundwater is discharged to the public wastewater treatment system. Compliance with discharge standards is measured by sampling contaminated groundwater as it enters and exits the on-Site treatment system. The system has been in compliance with discharge standards during the period of this FYR.

#### **Site Inspection**

The inspection of the Site was conducted on November 13, 2017. In attendance were Leah Evison of EPA, and Dan McNamara of MPCA. The purpose of the inspection was to assess the protectiveness of the remedy.

No ponds were observed on the landfill surface which would indicate significant settlement. The vegetated landfill cover showed evidence of having been mowed. No issues were observed with regard to the operation of the landfill or gas venting system or the groundwater monitoring system. At the time of the inspection, extraction wells were being redeveloped, which is a normal maintenance procedure for this Site. MPCA noted that an area of minor erosion by the creek is undercutting the landfill fence at one location, and that repair was in process.

### **V. TECHNICAL ASSESSMENT**

**QUESTION A:** Is the remedy functioning as intended by the decision documents?

#### **Question A Summary:**

Yes. In the major respects, the remedy is functioning as intended by the decision documents. However, as explained below, additional sampling is needed to confirm plume capture for certain contaminants. In addition, some remedy upgrades and modifications are not reflected in the decision document. This was also noted in the 2013 FYR.

A cap meeting Resource Conservation and Recovery Act standards was constructed for the landfill and is properly maintained. The remedy selected in the ROD required a passive gas venting system, which was upgraded to an active gas collection system in 1998. The active gas system is operating successfully and no methane was detected in gas probes at the perimeter of the landfill during the period of this FYR.

Groundwater extraction wells are capturing the majority of the plume, and discharge to Coon Creek is likely to be effectively containing the remainder of the plume. Plume capture needs to be confirmed for 1,4-dioxane and PFAS/PFCs, if present. One RAO in the ROD is to eliminate or minimize discharge to Coon Creek. Discharges to Coon Creek during the period of this FYR did not exceed surface water quality standards; however, the FYR recommends that MPCA add comparison to surface water quality standards to their routine data analysis for the Site, to ensure that any future exceedance is identified and addressed as quickly as possible. The ROD anticipated groundwater treatment using air stripping and/or carbon adsorption with discharge to Coon Creek, but also recognized that final decisions about treatment and disposal would be made during design. Current treatment includes granulated activated carbon treatment for one extraction well containing PCBs and treatment in an aeration pond for other

contaminants. Treated water is discharged to the MCES public sewerage system. Treatment and discharge standards are being met.

A clay slurry wall was constructed around the hazardous waste pit with leachate extraction from beneath the pit and gas extraction from within the pit. The ROD anticipated that pumping in the pit would allow an inward hydraulic gradient to be maintained across the slurry wall. Pumping has not been able to maintain an inward gradient across the wall and an additional liquid and gas condensate removal system that was installed in the pit has also not stopped leakage from the pit. Contamination that escapes the pit is contained and treated in the groundwater treatment system, but this is costly and MPCA has obtained State funding to remove and properly dispose of hazardous wastes from the pit. Under its deferral agreement with MPCA, EPA retains authority over the Site to the extent that the proposed response actions are not “at least as protective of human health and environment as response actions required under CERCLA.” MPCA has provided EPA with documents relevant to its proposed action has agreed to document its decision consistent with existing Minnesota law and procedures.

O&M procedures, as implemented, will maintain the effectiveness of the remedies. O&M costs have increased in recent years, mainly due to PCB leakage from the hazardous waste pit. MPCA continues to monitor the Site for possible optimization and cost savings, and expects removal of the hazardous waste pit to reduce O&M costs in the future.

Access controls, including fencing, warning signs, and monitoring well locks, are in place and are effectively preventing exposure to contaminated materials. ICs are also in place and effective in preventing exposure.

**QUESTION B:** Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

**Question B Summary:**

Yes.

The ROD established groundwater cleanup goals as HRLs and MCLs rather than a numerical value and MPCA compares groundwater monitoring results to current drinking water standards.

No new exposure pathways have been discovered at the Site and standardized risk assessment methodologies have not changed in a way that could adversely impact the protectiveness of the remedy. The groundwater plume is not a potential source of vapor intrusion into buildings because land use above the portion of the plume that extends beyond the waste boundary is open space and contaminant concentrations in this area are low. In addition, Coon Creek acts as a hydraulic barrier to any potential vapor movement north of the creek. The area covered by the groundwater plume is under the responsibility and control of MPCA and the plume does not extend to areas of residential or other uses. The remedy is progressing as expected towards meeting RAOs.

**QUESTION C:** Has any other information come to light that could call into question the protectiveness of the remedy?

No.

No other information has come to light that could call into question the protectiveness of the remedy. Groundwater monitoring results and monitoring of hydraulic gradients across the slurry wall suggest that contaminant plume migration from the hazardous waste pit is not entirely contained. However,

MPCA is successfully capturing and treating this contamination using the groundwater extraction and treatment system and continues to reduce contaminant mass in the pit using the vapor extraction system.

## VI. ISSUES/RECOMMENDATIONS

### Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	<b>Issue Category: Remedy Performance</b>			
	<b>Issue:</b> Extraction well pumping alone may not be fully capturing the plume, although plume migration is prevented by the combination of pumping and the presence of Coon Creek.			
	<b>Recommendation:</b> Further evaluate the extent of plume capture due to extraction well pumping and take actions to minimize discharge to the creek.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Party Responsible</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	State	EPA	6/30/2019

OU(s): 1	<b>Issue Category: Monitoring</b>			
	<b>Issue:</b> Groundwater data are not routinely compared to surface water quality standards.			
	<b>Recommendation:</b> Compare groundwater monitoring results for monitoring wells near the creek to surface water quality standards annually.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Party Responsible</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	State	EPA	6/30/2019

OU(s): 1	<b>Issue Category: Monitoring</b>			
	<b>Issue:</b> Not all extraction wells have been sampled for 1,4-dioxane or PFAS.			
	<b>Recommendation:</b> Conduct additional sampling for 1,4-dioxane and PFAS to confirm plume capture for these contaminants.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Party Responsible</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	State	EPA	6/30/2019



OU(s): 2	<b>Issue Category: Remedy Performance</b>			
	<b>Issue:</b> The proposed removal of the wastes from within the hazardous waste pit is not anticipated by the ROD.			
	<b>Recommendation:</b> Document a remedy change decision consistent with Minnesota law and procedures and ensure that the design and implementation of the action to remove wastes from within the hazardous waste pit is at least as protective as the remedy selected in the ROD.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Party Responsible</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	State	EPA	12/31/2019

## OTHER FINDINGS

In addition, the following are recommendations that were identified during the FYR, but do not affect current nor future protectiveness:

- MPCA should document past and upcoming changes to the remedy related to the gas control system, groundwater treatment methods, and hazardous waste pit removal, consistent with existing Minnesota law and procedures.

## VII. PROTECTIVENESS STATEMENTS

Protectiveness Statement(s)	
<i>Operable Unit:</i> 1	<i>Protectiveness Determination:</i> Short-term Protective
<i>Protectiveness Statement:</i> The remedy at OU1 currently protects human health and the environment because the groundwater plume is captured and treated, and groundwater-use restrictions are in place and effective. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: further evaluate the extent of plume capture due to extraction well pumping and take actions to minimize discharge to the creek; compare groundwater monitoring results for monitoring wells near the creek to surface water quality standards annually; and conduct additional sampling for 1,4-dioxane and PFAS/PFCs to confirm plume capture for these contaminants.	

Protectiveness Statement(s)	
<i>Operable Unit:</i> 2	<i>Protectiveness Determination:</i> Short-term Protective
<i>Protectiveness Statement:</i> The remedy at OU2 currently protects human health and the environment because the landfill cap and active gas collection system are in place and being effectively maintained, gas probes adjacent to residences demonstrate current protectiveness, and land use controls are in place and effective. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: document a remedy change decision consistent with Minnesota law and procedures and ensure that the design and implementation of the action to remove wastes from within the hazardous waste pit is at least as protective as the remedy selected in the ROD.	

Sitewide Protectiveness Statement
<i>Protectiveness Determination:</i> Short-term Protective
<i>Protectiveness Statement:</i> The remedy for the Site is currently protective of human health and the environment in the short-term because there is no evidence of a cap breach, the groundwater plume is captured, existing Site uses are consistent with the objectives of the land and groundwater-use restrictions, and institutional controls are in place and effective. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: further evaluate the extent of plume capture due to extraction well pumping and take actions to minimize discharge to the creek; compare groundwater monitoring results for monitoring wells near the creek to surface water quality standards annually; conduct additional sampling for 1,4-dioxane and PFAS/PFCs to confirm plume capture for these contaminants; and document a remedy change decision consistent with Minnesota law and procedures and ensure that the design and implementation of the action to remove wastes from within the hazardous waste pit is at least as protective as the remedy selected in the ROD.

## VIII. NEXT REVIEW

The next FYR report for the Waste Disposal Engineering Superfund Site is required no less than five years from EPA's signature date of this review.